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ABSTRACT

This annual report of the Yale Project describes the progress made on the nutrition and growth study of Tunisian children from September 1, 1971 through August 31, 1972. The report details: (1) the progress in analysis of the cross-sectional study data, which was completed as of June 30, 1972, and (2) the development of the present longitudinal study. The longitudinal study is exclusively urban and interventional in nature and is designed to test the hypotheses derived from the cross-sectional study. These hypotheses are: (1) Malnutrition, synergistic with infection, contributes in large part to the demonstrated gross social class differences in mental and physical growth and physical health. (2) Cultural malnutrition as represented by parent-child intervention and other sociocultural factors plays a part to be measured in the above differences. Organizational and data collection problems of the longitudinal study are discussed under the following categories: biomedics, sociology, psychology, and nutrition. Plans for analysis, interpretation, and publication of study data are also included in the report. (CS)

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NUTRITION AND CHILD GROWTH AND DEVELOPMENT IN TUNISIA

Annual Progress Report

September 1, 1971 - August 31, 1972

PS007622

Tunis
November 15, 1972

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I. Pertinent Data

A. Title of Research: Nutrition and Child Growth and Development in Tunisia

B. Agreement No. : 07-001-1, Public Law 480, Section 104(b) (3)

C. Parties to the Agreement:

(1) The United States Government as represented by the National Institutes of Health, DHEW, Bethesda, Maryland 20014, U.S.A.

(2) Tunisian Ministry of Public Health, Tunis, Tunisia

D. Collaborating Institutions:

(1) Tunisian National Institute of Nutrition and Food Technology

(2) Tunisian National Institute of Child Health

E. Co-Principal Investigators:

(1) Dr. Bechir Hamza, Director, National Institute of Child Health, Tunisia

(2) Dr. Zouhair Kallal, Director, National Institute of Nutrition and Food Technology, Tunisia

(3) Dr. Harben Boutourline Young, Associate Professor of Clinical Pediatrics and Public Health, and Director of Yale University Medical and Social Sciences Research Unit, 8 Rue Nigeria, Tunis, Tunisia

F. This Report Prepared By:

Harben Boutourline Young, M.D.

G. Distribution of this Report:

(1) National Institute of Child Health and Child Development, U.S. Department of Health, Education and Welfare

(2) The Grant Foundation of New York, for the four-year grant to Yale University, as well as previous years of support.

(3) The Swedish International Development Authority, for providing the services of Miss Kerstin Almrin, Chief of the Nutrition Section.

(4) UNICEF, for providing the entire quantity of "superamine" (valued at $12,000) needed for the three-year duration of the study.

(5) CARE-MEDICO Foundation, for providing cereals, oil and low-fat dry milk

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(6) U.S. A.I.D./Tunis, for financial and logistical support in previous years of the cross-sectional study of approximately 8,000 males and females from birth to 16 years. This study was completed on June 30, 1972 but the data is still being analysed.

(7) National Center for Health Statistics, U.S. Department of Health, Education and Welfare, for financial support in previous years of the cross-sectional study referred to above.

(8) U.S. Peace Corps/Tunis, for providing some needed personnel.

(9) Dr. Charles D. Cook, Project Officer, and Chairman of Department of Pediatrics, Yale University School of Medicine

(10) Dr. Bechir Hamza, Director, Tunisian National Institute of Child Health

(11) Dr. Zouhair Kallal, Director, Tunisian National Institute of Nutrition and Food Technology

(12) The Fogarty International Center, National Institutes of Health: Dr. Morris Jones

II. Introductory Note

This report describes progress in analysis of the cross-sectional study and in development of the present longitudinal study.

As can be remembered from previous reports by the writer, the cross-sectional study, which was completed on June 30, 1972, provided the hypotheses to be tested in the longitudinal study.

Both of these studies referred to above will be treated separately and in detail. As the cross-sectional study was completed on June 30, 1972, current activities in this sector are mostly checking of records (with completion of any missing data), punching and verification of the data for adolescent group, analysis and construction of physical and mental growth standards from birth to 16 years in both sexes as well as delineation of social class differences in health and growth.

Active ongoing collection of data is confined to the longitudinal study. Therefore, this study will be given preference in this report.

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III. The Longitudinal Study

A. Design in Detail

The original design approved by Study Section and NICHD was of five groups of small children from impoverished social groups in five different "poor" areas of the City of Tunis. The study was exclusively urban and interventional in nature in order to test hypotheses deriving from the cross-sectional study.

These hypotheses were as follows:

1. Malnutrition, synergistic with infection, contributes in large part to the demonstrated gross social class differences in mental and physical growth and physical health.

2. Cultural malnutrition (see cross-sectional study) as represented by parent-child interaction and other socio-cultural factors play a part to be measured in the above differences.

   It was important that ethnic and possible genetic differences should be taken into account.

In the two-year period between approval by Study Section and funding, a good deal of thought was given as to how the design might be improved. The few large scale longitudinal studies of this kind do not effectively randomise subjects amongst areas but it was felt important to do this. The experiment was not taking place in an institutional or other easily controlled environment but in a natural situation.

The interventional factors were nutritional supplements of three types and pediatric care. A control group, not in contact with physicians of the research, would depend upon Tunisian local resources, both socio-cultural and medical.

An initial problem in the improved design was that of randomization. This was possible and was effected in four areas (with 3 types of supplementation but 4 groups, as one of the "local product" supplementation groups would move up to a low cost effective North African weaning food at approximately one year after first supplementation). In each of these four impoverished areas there are now approximately 25% of each of the four supplemented groups. All have received pediatric care. What was not possible in a human experiment was

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randomization of Group 5 amongst the four areas. This would have meant attendance of Group 5 (receiving pediatric care but no supplementation) at the same centers where their neighbours and perhaps relatives were receiving both benefits. Accomodation is hard to find in these areas and a doubling of centers (apart from cost) was not feasible. Therefore, for reasons which were not only humane but also sprang from common sense, it was decided to concentrate Group 5 in one of the impoverished areas and to encourage the sociological section to convince the research group that no substantial socioeconomic differences existed between the areas. This was the assumption of the initial staff sociologist and subsequently also a senior sociologist from that Department of the University of Tunis. Apart from this, to return to the matter of common sense, it is clear that resentments and hostilities engendered by obviously different treatments in the same centers would have interfered more with the good conduct of the work than the necessary risk which was taken.

Group 6 (receiving neither medical care nor supplementation) was randomized through the five areas. A few extra subjects in Group 6 were brought into the Group 5 area in the final two weeks of the intake (November 29, 1971 - March 23, 1972) but some of these were lost. In any case those who remain (about 15) have been tagged.

Thus the work began with about 600 subjects from poor families born in the three maternity centers (where 90% of such subjects are now born) and examined between 24-72 hours of birth. The first 24 hours was avoided because of birth trauma and 72 hours as the limit imposed because many women leave the hospital even at 2 days.

The supplements (4 groups and 3 types of supplements) look alike and have the same texture. They are very different in composition as No. 1 is made of egg and milk with some sorghum, No. 2 is superamine (the North African UNICEF sponsored weaning food*, and No. 3 is from local cereals and pulses such as might be made by any impoverished mother for her child.

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*A mixture of cereals plus 10% skimmed milk and fortified with vitamins.

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Thus the mothers and children do not have any idea of the nutritional value of their supplement nor do the observers at the central office know to which group a supplemented child may belong. Every effort is made to ensure that the observers do not know the identity of groups 5 and 6.

It was planned that routine physical examinations would take place at 4, 8, 12, 18, 24 and 30 months of age. Testing with the Bayley Scale would take place at 6, 12, 18, and 24 months of age, all at the central office.

Vaccinations with B.C.G.* were carried out at birth and observations subsequently made for positive tuberculin reactions.

Inoculation against DTP and Polio was performed between 4 and 8 months.

Measles and German measles vaccination is planned for 12 months.

Ongoing pediatric care was afforded at the feeding centers or transportation arranged to the central office where such care could be provided on days when there was no clinic. Records were kept and have been partially transformed into precoded morbidity forms.

B. Logistics

An initial problem was the expansion and training of a staff of less than 20 in the cross-sectional study to one of more than 80 in the longitudinal experiment. These included new social workers who had to be prepared before the sample itself could be brought in. There were two new pediatricians available in early October and they had to discuss in depth with the field director the kind of examination to be made of the new-born babies and the variables within each part of the examination. There was pretesting to be done and also reliabilities between the observers. A third pediatrician arrived only in mid-November and had to undergo a "crash-program" in the methodology.

Two research workers in psychology wished to identify women in mid-pregnancy and to undertake nutritional surveys before the babies appeared in the sample at birth. This was rejected, in part because the identification of all pregnant women in selected depressed areas of Tunis would have meant a private census effort

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beyond our resources, in part because the first day of the last menstrual period is utterly unreliable (many women pass from one pregnancy to the next without a menstrual period) and thus the possible differences in ages in the newborns would have been too great and more subject to seasonal fluctuations, and in part because neither we nor the Swedish medical team* could detect social class differences at birth upon such important variables as weight and length. We were forced to assume that the impoverished pregnant woman in Tunis probably had almost sufficient calories and that the national dish "cous-cous" based on wheat but also with other cereals and vegetables, but rarely animal protein at these social levels, probably had a sufficient amount of all essential amino acids for the placenta to do an adequate job of obtaining what was necessary for a well-nourished newborn infant. In addition, a number of women would again become pregnant during the course of the study. This would give an opportunity for ancillary studies.

It was decided to make the first examination between 24 and 72 hours following birth in the three major maternity centers where more than 90% of impoverished women have their babies in the City of Tunis. The examination of 600 infants would take 4 months.

As stated, a team of less than 20 had to be expanded to one of more than 80. Much training was required and decisions had to be taken to determine whether each group and every individual within that group were sufficiently prepared for the project to start.

A great problem was the possible overlap of the summer "diarrhoea period" and the commencement of supplementation and the adverse consequences which the families might attribute to this. This meant that the date of commencement (given that the minimum time period to achieve an intake of 600 acceptable newborn infants would be 4 months) would have to be the end of November, 1971 with last influx towards the end of March, meaning first supplementation of the last intakes before the end of July, thus avoiding the gastroenteritis months of August and September for initiation of supplementation, or postponing initiation until the end of May, 1972. In this latter case the first babies would have received supplementation in early October, 1972, when gastroenteritis should have undergone a noticeable decline. This entailed newborn examinations from June 1 - September 30, 1972. However, by its decision to afford funds only at the end of September, 1971, and to limit the funding to three years, the principal funding agency, NICHD, forced the decision to commence bringing in the

*which worked in a rural area of Cap Bon for several years

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the sample at the end of November, 1971. Further delay would have meant insufficient time to test the hypotheses. Another problem was the identification and acquisition of suitable feeding centers. These included Destourian Party political headquarters, the Womens' League for the Care of Children, a school and a private residence. We must thank the Tunisian authorities and people for their understanding and help. But there were other problems: the different kinds of supplements had been skilfully prepared by the chief of the Nutrition Section to look and taste approximately alike. All were prepared in a central kitchen but this room had no running water; the water had to be carried by hand from the nearest public fountain. This was both fatiguing and dangerous. After months of frustration and battle we now have running water in this kitchen at an installation cost of some $600.00.

There is still one center shared with a kindergarten; it is overcrowded and also dangerous from the epidemiological point of view. At last we have acquired a private dwelling.

The present composition of the areas is as follows:

Supplementation and Pediatric Care (Areas 1 - 4)	Area 1	Djebel Lahmar	110 infants	54 boys	56 girls
	Area 2	Melassine (with one sub-center)	91 infants	46 boys	45 girls
	Area 3	Medina	81 infants	41 boys	40 girls
	Area 4	Saida Manoubia	81 infants	42 boys	39 girls
Pediatric Care in all seven centers	Area 5	Djebel Djelloud (with one sub-center)	93 infants 456 infants	45 boys	48 girls
No Care; No Supplementation	Group 6	through the 5 areas	93 infants		
		Total	549 infants		

Losses in areas 1 to 5 have been as follows:

Deaths	30
Change of residence outside the area	19
Refusals to participate	15
Eliminated for medical reasons	5
Total Losses	69

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Losses in Group 6 will be available in the near future. This group is more difficult to hold as they receive nothing but contact with an effective social worker, photographs and some small items of clothing. On the other hand, the pediatric care and supplementation are greatly valued in the other groups.

The daily transportation of supplements from the central kitchen, of home visitors and feeding center personnel to their centers, of well children to the central office for examination, of sick children to the central office or hospital, and necessary dispensing activities require the services of 8 automobiles and drivers plus frequent use of the private cars of senior professional personnel. The transportation system is running remarkably smoothly.

As of the date of this report the physical examination of the 8-month-old children is drawing to a close. All eligible infants have received the Bayley test. Physical examinations at 1 year of age are due to commence on November 29, 1972.

Attendance at the feeding centers has continued at a satisfactory level and the home visitors who go to every home at least once a week have cemented good relations with the families.

C. Personnel

These number in all 82 including two Peace Corps workers (one M.A. (Soc.) and one diplomed lab assistant).

Foreign national personnel are as follows:

Scientific Director (Pediatrician)

1 Pediatrician (French)

1 Sociologist (M.A.) (American)

1 Nutritionist (Swedish)

1 Programmer (Swedish)

*1 Statistician p.t. consultant (Italian)

*1 Doctor of Medicine (Research) p.t. (Italian/U.K.) consultant

1 Lab. technician (American) with possession of a regular diploma from Wisconsin

1 Administrative Assistant (B.S.) (American)

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*These professional workers are voluntary consultants who participated in previous work of the project.

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In addition there are four foreign nationals who are now residents in Tunisia. These include:

1 Board Eligible Pediatrician (American)

1 Psychologist (M.A.) (French)

1 Administrative Associate (French)

1 Administrative Assistant (French)

Thus the bulk of the staff is Tunisian and there are sufficient Tunisian technicians for the project to be a valuable training ground for their preparation and advancement.

Former Foreign National Personnel

Two psychologists (American), one pediatrician (Italian) and one temporary programmer (American) left the project during the year. The departure of the two psychologists is particularly regretted. It is probably advisable that new professional workers should have adequate knowledge and understanding of a culture before committing themselves within it for a period as long as two years.

Any longitudinal study of this size, multidisciplinary, international and in a developing country, requires much critical thinking amongst the participants and especially the senior foreign national personnel. Inevitably some will have built up unrealistic expectations. This has involved shakedown problems with the departure of some research workers (4) and the arrival of others. This is an inevitable process in forming a good and cohesive research team and the process takes time. The research team now seems resilient, well prepared, and capable of solving present and future research problems. Internal communication seems good.

Pleasure is recorded in the Director's association with Dr. Hamza and his group at the Tunisian National Institute of Child Health, and the association with Dr. Kallal, Director of the Tunisian National Institute of Nutrition. It is his earnest wish that these two Institutes work closely together for the benefit and full development of the Tunisian child.

In view of cases of cholera in Tunisia the whole staff has been vaccinated.

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D. Notes on Sections

(1) Biomedics

As previously reported, most of our pediatricians in the cross-sectional study came on rotation from Zurich University Pediatric Clinic. These were excellent pediatricians all selected by Professor André Prader. They stayed for periods of four to six months and worked with two Tunisian pediatricians. We then had a French doctor who did a very good job for more than one year. In the longitudinal study the situation has been stabilized in that the five doctors appear to be permanent;* four of these are board or board eligible pediatricians and the fifth is an M.D. with a M.P.H. in Maternal and Child Health and Nutrition from Harvard. Two of the doctors are Tunisian and a third is married to a Tunisian. Dr. Redjeb, Assistant Director, is doing a very good job as indeed are all the other M.D.'s.

The laboratory work has been done by Mr. Dali who will continue to work alongside Miss Kathy Thorn[illegible] a well-trained lab technician who will take charge of electrophoresis and possibly participate in immunology.

Anthropometrics have been taken over by Mr. Kamoun (X-ray technician and qualified nurse) who had experience of measurements in the cross-sectional study. Mr. Malek, actual X-ray technician, is in training with Mr. Kamoun.

Madame France Birke continues to do an excellent job in the administration of this section.

The M.D.'s meet to discuss problems such as standardization of medical care, keeping of adequate records and transfer of information to the morbidity forms.

All the forms are precoded and designed for us by a professional programmer (Mr. Gigante).

The morbidity forms have been completed for the six-month age period and after a full year of experience it will be possible to semi-quantify such illnesses as gastroenteritis, upper and lower respiratory infections and skin diseases.

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*They are expected to stay for the duration of the study.

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The examinations following birth (24-72 hours) required reassurance on only two points:
(a) freedom from physical handicaps and
(b) gestational age between 37 and 41 weeks.

The Medical Section laboured mightily to prepare methodology and to integrate efforts before the commencing date of November 29, 1971 which was determined by the needs of NICHD and of the Nutritional Section. Fortunately in such an experiment there were only two really important factors to determine in the examination of the newborn. One was gestational age which should be between 37 and 41 weeks and the other was the exclusion of handicapped children: in more than 600 children examined between 24 and 72 hours after birth only two were subsequently excluded because of defects which might have been recognized; these were one albino and one with congenital syphilis. Subsequently some others were excluded such as one with possible hydrocephalus but all of these appear to be from post birth phenomena. In fact the physical examination of the newborn yielded such close results between the three pediatricians and occasionally the scientific director that most variables would have approached $r = 1.00$.

In contrast to this was the gestational age. This was measured by a nomogram incorporating body weight and length, the Farr scale of maturity at birth, and cranial circumference. An earlier attempt to use bi-parietal width was abandoned because the standards were from the Netherlands where the heads appear to be squarer than in Arab countries. X-rays of the knee were also taken but in the lack of adequate standards to measure gestational age by this measure (sex controlled) a staff research member, P. Louyot, M.D., Pediatric Specialist, has undertaken a personal investigation in order to develop a methodology.

Reliabilities between observers on the total Farr score were as follows:

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Comparison between Doctors in Farr Test

Using the formula Smeas.* $= \sqrt{\frac{1}{n2}\frac{\Sigma D^2}{N}}$

where D is the difference between measurements taken one hour apart by different doctors or by the same observer.[2,3]

		Smeas	% Mean Value
Louyot-Miladi (35 subjects)			
Louyot	mean = 39.8	0.89	2.1%
Miladi	mean = 39.7		
Difference (Δ) = 0.09 = (0.23% of mean values)			
Louyot-Petriccioli (20 subjects)			
Louyot	mean = 39.9	0.77	1.91%
Petriccioli	mean = 40.4		
Difference (Δ) = 0.45 = (1.12% of mean values)			
Miladi-Petriccioli (37 subjects)			
Miladi	mean = 39.3	0.76	1.9%
Petriccioli	mean = 39.9		
Difference (Δ) = 0.62 = (1.56% of mean values)			

Given the basic experimental requirements at birth, the results so far available are acceptable. Reliabilities between observers on the head circumference are as follows:

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*S is the reproducibility of the measurements. Where S is little more than the error of the instrument there is little point in further statistical tests for reliability in parametric measurements.

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Head Circumference

		Smeas	% Mean Value
Louyot-Miladi (26 subjects)			
Louyot	mean = 34.9	0.38	1.1%
Miladi	mean = 34.6		
Difference (Δ) = 0.29 = (0.84% of mean values)			
Louyot-Petriccioli (10 subjects)			
Louyot	mean = 34.3	0.26	0.8%
Petriccioli	mean = 34.3		
Difference (Δ) = 0.02 = (0.06% of mean values)			
Miladi-Petriccioli (24 subjects)			
Miladi	mean = 34.4	0.43	1.2%
Petriccioli	mean = 34.1		
Difference (Δ) = 0.31 = (0.91% of mean values)			

The effect of such differences upon the gestational age (as estimated by head circumference) is negligible.

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Height - Weight

Reliabilities between observers on the gestational age as estimated by the height/weight nomograms were as follows:

		Smeas	% Mean Value
Louyot-Miladi (31 subjects)			
Louyot	mean = 39.27		
Miladi	mean = 39.26	0.55	1.4%
Difference (Δ) = 0.01 = (0.03% of mean values)			
Louyot-Petriccioli (10 subjects)			
Louyot	mean = 39.25		
Petriccioli	mean = 39.06	0.55	1.4%
Difference (Δ) = 0.19 = (0.49% of mean values)			
Miladi-Petriccioli (26 subjects)			
Miladi	mean = 39.03		
Petriccioli	mean = 39.07	0.42	1.1%
Difference (Δ) = 0.04 = (0.10% of mean values)			

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Neurological Exam [4,5,6]

Reliabilities on gestational age from the neurological examination were as follows:

		Smeas	% Mean Value
Louyot-Miladi (8 subjects)			
Louyot	mean = 39.5		
Miladi	mean = 39.6	0.22	0.6%
Difference (Δ) = 0.19 = (0.50% of mean values)			
Louyot-Young (6 subjects)			
Louyot	mean = 39.6		
Young	mean = 39.8	0.22	0.6%
Difference (Δ) = 0.17 = (0.40% of mean values)			
Miladi-Petriccioli (14 subjects)			
Miladi	mean = 39.8		
Petriccioli	mean = 39.6	0.29	0.7%
Difference (Δ) = 0.17 = (0.40% of mean values)			
Miladi-Young (12 subjects)			
Miladi	mean = 39.8		
Young	mean = 40.0	0.43	1.1%
Difference (Δ) = 0.17 = (0.40% of mean values)			
Petriccioli-Young (7 subjects)			
Petriccioli	mean = 39.6		
Young	mean = 40.1	0.59	1.5%
Difference (Δ) = 0.50 = (1.30% of mean values)			

The reliabilities between observers on all four examinations are acceptable (Physical, Farr, Head Circumference, Height/Weight and Neurological).

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Results of the radiological index will be reported later.

Anthropometric Reliabilities

8 Month Examinations - 40 Doubles by Kamoun

Every day Mr. Kamoun does one double on himself. These are not consecutive examinations. Reliabilities up till now are as follows:

	Mean	Smeas	% Mean Value
Arm circumference	13.8	0.20	1.5%
Calf circumference	16.9	0.22	1.3%
Chest circumference I	43.3	0.34	0.8%
Chest circumference II	43.2	0.28	0.7%
Head circumference	43.2	0.22	0.5%
Bicond. femur	4.68	0.09	2.0%
Bi-iliac diameter	11.3	0.11	0.9%
Head bi-parietal	11.7	0.07	0.6%
Head length	15.2	0.11	0.7%
Chest width	14.4	0.22	1.5%
Chest depth	12.1	0.22	1.8%
Bideltoid	19.2	0.31	1.6%
Biacromial	16.3	0.37	2.3%

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	Mean	Smeas	% Mean Value
Skinfold biceps	4.20	0.20	4.7%
Skinfold triceps	6.98	0.39	5.6%
Skinfold ext. calf	10.7	0.37	3.5%
Skinfold int. calf	11.5	0.37	3.2%
Skinfold supra-iliac	6.33	0.32	5.0%
Skinfold subscap.	6.30	0.21	3.4%
Weight	7.62	0.02	0.3%
Length	67.3	0.19	0.3%
Crown rump	43.9	0.25	0.6%

These reliabilities (with the possible exception of skinfolds) are acceptable. Increased attention is being given to the skinfolds.

(2) Sociology

The Section of Sociology was concerned with a comparison of the selected zones and examination of the characteristics of the families of the study who were within these zones. These included socio-economic and psycho-social factors. These included such variables as occupation and educational level of the head of family and the mother of the child, total family income, both absolute and per head, family constellations, kinship patterns in the area, participation in social life, recreational and play opportunities for the children, hygienic facilities (including disposal of excreta, types of drains, availability of water and its quality), availability of markets and the relative prices of basic goods within them, distance from and use made of the nearest public medical center, plural marriages,

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occasional "emigration" work outside the country by the family head, density of the population in the zone, person-room ratio, place of origin of parents and how long each had been in Tunis, transportation facilities, availability to and use of mass-communication media, age of parents, mother's pregnancies, abortions, perinatal and infantile mortality within families as well as in zones, how total family income/month is distributed between the major expenditures and other factors. Absolute comparability between the zones and the samples in the zones was rejected by one newly arrived American research worker. On the other hand an experienced Tunisian sociologist, holding a senior University post, stated that from his extensive experience of the depressed areas of Tunis City the zones should be regarded as comparable unless it could be proved otherwise. Appendix I lends support to this view.

Mr. Ridha Boukraa, who has a doctorate and is Lecturer in Sociology, Tunis University, will be associated with Mr. John McDowell, M.Sc. (Sociology), together with four social workers to explore these matters further. An enquiry has now been agreed upon prior to pretesting and it is anticipated that the final form should be applied during the course of November, 1972 and at later dates. The Section of Sociology has been immeasurably strengthened.

The Section of Sociology is working closely with the 10 home visitors in nutrition and with the social worker in charge of Group 6.

(3) Psychology

The chief of this section is Dr. El Amouri, a well-trained Tunisian with a doctorate in psychology from the Sorbonne. When he took over the two American psychologists had just left. He had two months in which to prepare his psychological testers (then still engaged most mornings in the cross-sectional study) for the Bayley testing at six months of age. These testers worked every afternoon with infants extraneous to the research. After almost the end of this period observer reliability is reported as follows: Observations upon the judgments of four independent observers upon 30 infants aged 6 months (outside the research).

Motor 23 items. Maximum correlation coefficient in each case 1.0; minimum 0.79. 17 items between 1.0 and 0.9.

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Mental 56 items. Maximum correlation coefficient in each case 1.0; minimum 0.73. 41 items between 1.0 and 0.9 (r). (Kendall's TAU)

This was regarded as acceptable and therefore Bayley testing commenced at the six-month period. During the month of August two of the four testers left the project; one was close to termination of pregnancy and the other wished to resume her university studies following an appropriate vacation. Fortunately the other two testers were able to carry on and they have since been joined by a third tester who is undertaking reliability training.

Thus the Bayley commenced at the 6-month point and will be repeated at 12, 18 and 24 months. If sufficient time is given us, the already established preschool test will be administered at 30 months.

Bayley testing has now been completed for almost all the infants and the next cycle will be at 12 months.

Madame Rabhi (M.A.) has prepared an instrument to assess infant-mother interaction as well as another to examine traditional songs and stories told to very small children. In addition, Madame Kraienahas applied an instrument "the imaginary house" in order to explore the family situation. This was applied to a subsample of 140 mothers and the results have just been published (in French, mimeographed forms, copies available). McClellan type projective tests are also being applied to a sub-sample of the mothers.

(4) Nutrition

Miss Almrin succeeded in forming a highly motivated and hard-working team of some thirty assistants in the feeding centers, as home visitors (10), and general workers. She is in the process of writing up the results of an enquiry (3/1) into the dietary habits of the mothers during breast feeding. Her enquiry 3/3 on hygenic nutrition is complete except for some families in the Medina because of the departure of one of the home visitors (now replaced). This study will soon be completed.

As stated, there is close collaboration with the newly reconstructed sociology section and that of nutrition.

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The central kitchen has been transferred to the new center at Melassine from which distribution will be easier and where there is much more space.

A series of daily seminars between sociology and nutrition promises to make the new sociological investigations of mutual profit, not only to both sections but also to the research as a whole. During the course of the next year a number of students from the Tunisian National Institute of Nutrition will participate in the nutritional research as part of their practical work.

Miss Almrin's work may be regarded as a model of its kind.

(5) Programming and Analysis

After some initial difficulties due to a health breakdown of Mr. Letchford, our English programmer, the temporary services of Charles Turner, M.Sc. were acquired until September, 1972. Unhappily, he left in early July but we were then lucky to acquire the services of Mr. Thomas Dahr, a Swedish programmer who has committed himself for the present life of the project. At the same time we were pleased to welcome back Dr. Gino Tesi as statistician-programmer (consultant p.t.) and Dr. Elizabeth Boutourline (consultant p.t.), and plans have been formulated to process, analyse and write up all the data in the most expeditious manner.

In the longitudinal study the data on newborns and the four-month-olders have been punched and analysed as also the six-month-olders on the Bayley test. Reliability tests are being done frequently. Just as soon as all the eight-month-olders are examined, which will be within a few days, these forms too will be sent for punching and verification.

At the 12-month point it will be necessary to break the code for the sociological section who will need to compare groups as well as areas.

The 360/30 at the Electricity Authority in Tunis has a limited capacity both in memory units and time availability, although we are most grateful to them for their many courtesies and kindness. We are also charged commercial rates for time on this instrument whereas at the large computer at Pis[illegible]here is an approximate 90% discount.

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All material is being transferred to duplicate tapes of which one will be held in Tunis and one in Pisa. It seems clear that a substantial proportion of analysis must be done at the Pisa University Computer Center.

IV. The Cross-Sectional Study

A. Design

The design of this study has been reported on numerous occasions.

The children comprise some 8,000, equally divided as to sex and extending from birth to 16 years in the area of Greater Tunis.

The sample is stratified socio-economically with equal numbers in each of the five social groups. As the percentage contribution of each social group to the total population is known it is possible to construct norms for the whole population both in centiles and stanines and also to present social class differences and the norms for the privileged which might represent a potential for the presently underprivileged.

B. Records and Analysis

All punching and verification has been completed from birth to 12 years. In the adolescent period $12\frac{1}{2}$-16 years some 1,000 (out of 8,000) X-ray plates are still to be rated as an M.D. we had trained (no longer with the project), did not meet a written commitment, and also about 200 social histories are to be completed. These latter should be finished within one month. Rating of the X-rays depends upon the projected visit of Mr. Reginald Whitehouse. This is most important for training purposes. The visit of Mr. Whitehouse is now approved by NICHD, and he will be with us from December 7 to December 31. All this work will then be completed by December 31, 1972.

As in the longitudinal study programs and data are being duplicated so that we have one set at the Tunis center and the other in Pisa.

With the return of Dr. Gino Tesi it is anticipated that analysis of the cross-sectional study will proceed rapidly. Now all punching and verification is completed rapidly in Tunis.

The Pisa University Calculating Center will be closed for one vital month or more from December 15-January 15. Fortunately the CDC 6600 at Bologna (with terminal in Florence) will be available at this and other periods.

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C. Program for Publication

Publications from the Tunis study (started in 1966) number four and major talks (mainly invited) at international meetings number fourteen. It is anticipated that the Tunis cross-sectional study will be completely analysed and interpreted by the end of 1973. A new paper on emergence of deciduous teeth by social class and sex has just been accepted by Human Biology.

For the Tunis longitudinal study it is vital to have funds for the third year, as otherwise it will not be possible to test the hypotheses. The World Bank has been sympathetic but considers that the original sponsors should undertake this.

V. Summary

A. Longitudinal Study

The design appears to be comparable if not superior to those at present conducted in other developing countries.

Logistical problems have been solved in great part and the whole mechanism is now moving smoothly.

After the loss of some personnel, which is characteristic of new ventures, the present team is working in a friendly and productive atmosphere. Following the termination of Ramadan, (the period of daily fasting for 1 month from sunrise to sunset by all Mohammedan adults when the personnel become very tired and the work slows down) regular intersectional meetings and senior staff conferences were resumed in full. The training of Tunisian personnel is receiving increasing emphasis.

The various Sections are working well with themselves and also together. Increased emphasis has been placed on methodology and reliabilities. The reconstructed Sociology Section shows great promise.

Plans for analysis appear realistic and we have the personnel to complete these and also the writing up.

B. Cross-Sectional Study

Some 200 social histories still have to be completed. This will require but a few weeks.

About 1,000 X-rays all of children over 12 years have yet to be rated for reasons which have been stated. Mr. Reginald Whitehouse is nominated as consultant for

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the second year and approved by NICHD whose approval has been obtained for his offer to come for three weeks in December to complete these ratings and to train two M.D.'s (one Tunisian and one French) and one Tunisian technician, all on our staff. This is a great opportunity, not only for the completion of the cross-sectional study but just as importantly for discussions on analysis of the hand and wrist and the knee of the children in the longitudinal experiment.

Plans for analysis, interpretation and publication appear realistic.

VI. Addendum

A. Six curriculum vitae are attached for full-time members of the staff:

(1) Habib Redjeb, M.D., M.P.H.

(2) John McDowell, M.A. (Sociology)

(3) Thomas Dahr (Programmer)

(4) Ridha Boukraa, Ph.D. (Sociology)

(5) Tahar El Amouri, Ph.D. (Psychology)

(6) Dominique Rabhi, M.A. (Psychology)

B. A number of the mothers of our subjects in the longitudinal study are again pregnant. As a matter of routine a record will be kept of their diets. Whether their new babies should be examined is a matter for further discussion.

C. Appendix I provides a preliminary analysis between the five areas of the longitudinal study.

Subsequent information from the section of sociology will provide a much more complete picture.

D. We have many people to thank for their help. These include Consultants William Kessen; Paul Mussen; John McFie; staff member for one year, Howard Moss; Molly Lavine and countless others, including the Tunisian people and authorities as well as the U.S. Embassy and USAID, not to speak of the steadfast support of the Grant Foundation and other supporting agencies, including SIDA, UNICEF, Med-Care, U.S. Peace Corps and Yale University.

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We recognize the integrity with which the site visitors of April, 1972 carried out their evaluative mission but regret that the site visit was scheduled only six months after the initiation of our longitudinal study rather than after one year of operations as the NICHD letter of April 26, 1971 specifically had proposed. In view of the subsequent, we believe impressive, progress of the research program, the somewhat premature site visit seems especially unfortunate and another research review may be warranted to bring information up to date.

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ADDENDUM A. (1) CURRICULUM VITAE

HABIB REDJEB

Name : HABIB REDJEB
Birth Date : 11/25/1935
Place of Birth: Ksour-Essaf (Tunisia)
Nationality : Tunisian

1957 : Baccalaureat (Section: Experimental Sciences)
1959 : Diploma of (Biology and Chemistry) - School of Sciences Paris
1964 : Diploma of Candidate in Medical and Natural Sciences - Brussels
1969 : Diploma of Doctor of Medicine - Brussels (with Certificate in Parasitology)
1971 : MPH (MCH - Nutrition) - Harvard

Working Experience

1969-70 :- Head of a district clinic in Tunis
- Assistant at the Institute of Nutrition
1971-72 :- Assistant at the Institute of Nutrition
- Assistant at the Yale Project on "Growth and Development"

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(2)

CURRICULUM VITAE

JOHN RAY McDOWELL, JR.

Name : JOHN RAY McDOWELL, JR.
Birth Date : 14/9/1944
Place of Birth: Asheville, North Carolina
Nationality : American

Educational Background

	Date	Institution	Location
M.A. Sociology Thesis: "Agitation" and the California Farmworker Movement	June 1970	California State University	Sacramento, California
B.A. Social Sciences (Psychology, Sociology, History, Government)	June 1967	California State University	Sacramento, California

Professional Work Experience

Teacher: English as a foreign language	1971-1972	Lycée Mixte	Ksar Hellal, Tunisia
Teacher: English and Social Science	1970-1971	Burbank Unified School District	Burbank, California
Teacher: Social Studies	1969-1970	Sacramento Unified School District	Sacramento, California
Graduate Assistant	1968-1969	Sociology Department California State University	Sacramento, California

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Curriculum Vitae
John McDowell

Professional Work Experience (continued)

	Date	Institution	Location
Teaching Assistant	1967-1968	Sociology Department California State University	Sacramento, California
Research Assistant	1966-1967	Anthropology Department California State University	Sacramento, California

General Work Experience

	Date	Institution	Location
Men's Clothing Salesman	1965-1966	J.C. Penney Co.	Sacramento, California
Spice Mixer, Test Clerk	Summer 1963 Summer 1964	Libby, McNeill, Libby	Sacramento, California
Pizza Baker	1962-1963	The Pizza Haven	Berkeley, California

Languages

English, French, Arabic (basic familiarity)

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(3) CURRICULUM VITAE

ERLAND ROBERT THOMAS DAHR

Name	:	ERLAND ROBERT THOMAS DAHR
Birth Date	:	13/8/1943
Place of Birth	:	Stockholm, Sweden
Nationality	:	Swedish

Educational Background

1963	Matriculation examination in Gothenburg
1963 - 1964	Military service
1964 - 1967	Studies at the University of Lund in mathematics and economics
1968	Engineers examination in Helsingborg
1969 - 1970	Studies in computing techniques at the University of Gothenburg

Working Experience

December 1969- April 1970	Different minor programming works done for Gothenburg Universities Computing Centre
June 1970- August 1971 and December 1971- March 1972	Consultant programmer at the Institution for Cultural Geography at the University of Gothenburg

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(4) CURRICULUM VITAE

RIDHA BOUKRAA

Nom	:	BOUKRAA
Prenom	:	Ridha
Date & Lieu de Naissance	:	29/11/1941 à Tunis
Nationalite	:	Tunisienne
Diplomes	:	Licence de Sociologie (Juin 1964) (Prix du Président de la République)
		Doctorat 3ème cycle de Sociologie (Mars 1969)
Sujet de These	:	Etude sociologique d'un pôle de développement en économie sous-développée.

Principales Publications

- Les tanneurs d'hier et de demain (l'entreprise artisanale et l'entreprise industrielle)

  Economie et Humanisme, Février 1968.

- L'entreprise industrielle en milieu rural en Etude de Sociologie Tunisienne, 1968

- Quelques considérations générales sur la nouvelle organisation due système coopératif dans le gouvernorat du Kef, in Etude de Sociologie Tunisienne, 1968

- Les mutations de la profession médicale en Tunisie, in Sociologie des mutations, Anthropos, Paris, 1970

- Urbanisation, communication de masse et système social in Revue Tunisienne des Sciences Sociales, Septembre 1971, n° 26

Curriculum Vitae
Ridha Boukraa

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Principales Publications

- Culture et pauvreté.- le cas d'une cité populaire à Jendouba in R.T.S.S. n° 27.
- Développement régional et développement national (actes du colloque de la renaissance du monde arabe, Louvain Novembre 1970) Duculot, Belgique, 1971.
- Les attitudes des cadres de la nouvelle industrie tunisienne colloque du VIII congrès de l'Association des sociologues de langue francaise, Septembre 1971) paru en ALLEMAGNE dans la Revue DIE DRITTE WELT N° 4, 1972.
- Enquête pilote sur les attitudes et opinions des téléspectateurs dans le grand Tunis, exemplaire ro-néotype, Tunis 1968. Document Radio Télévision Tunisienne.

Travaux en Cours

- Fonction et rôle des moyens de communication de masse dans les pays du tiers monde.
- Problèmatique pour une sociologie médicale dans la culture arabo-musulmane.
- Enquête sur le Drain-Drain (avec la collaboration de l'U.N.I.T.A.R.) (O.N.U.)

Fonctions

1965-1968 : Attaché de recherche au Bureau de Recherches Sociologique (Ministère du Plan et de l'Economie Nationale).

1968-1969 : Chef de service des sondages d'opinion à la Radio Télévision Tunisienne.

depuis 1969 : Enseigne la sociologie et la psychologie sociale à la Faculté des Lettres et des Sciences Humaines.

Langues Utilisees: Arabe, Francais, Anglais

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(5)

CURRICULUM VITAE

TAHAR EL AMOURI

Tahar El Amouri	Né le 26.4.37 - àBizerte (Tunisie) Marié, un enfant
Fonction	Chef de la section Psychologie
Etudes	Primaire: école Franco-Arabe - Bizerte, 1945-1951 Secondaires: Lycée Stephen Pichon - Bizerte, 1951-1958 Supérieures: Faculté des lettres - Tunis, 1962-1963 Faculté de Paris Sorbonne - 1964-1970
Diplômes	Propédeutique lettres - Tunis, 1963 Licence Psychologie - Paris, 1966 Doctorat Psychologie - Paris, 1970

Expérience dans la recherche

Organisme	Fonction	Publications
Institut des Sciences de l'Education Tunis 1967 - 1969	Chef de la Section Psychologie	Etude sur les échecs scolaires Etude sur l'Histoire et l'Enséignement Religieux Etude sur la Scolarisation des filles (film) Etude sur les écoles rurales (film)

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Curriculum Vitae
Tahar El Amouri

Expérience dans la recherche

Organisme	Fonction	Publications
Faculté des Lettres Paris Sorbonne 1966 - 1970	Etudiant	Thèse sur les stéréotypes chez les enfants
Association sauve-garde de la Medina - Tunis 1970 - 1972	Psychologue	La Recherche - Action Enfants et milieu familial
Projet Harvard 67	Psychologue	Neant
Projet Yale depuis avril 1972	Chef de Section Psychologie	1 article sur le milieu familial ("La Maison Imaginaire") 1 article en cours: conception d'une épreuve projective pour les mères

Expérience dans l'Enséignement

Organisme	Fonction	Matiere Enseignee
Faculté des Lettres - Tunis 1968 - 1969 et 1971 - 1972	Professeur	Psychologie Expérimentale - (cours) Psychologie de l'Enfant - (Travaux Pratiques) Techniques de l'apprentissage (cours)

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Curriculum Vitae
Tahar El Amouri

Expérience dans l'Enséignement

Organisme	Fonction	Matiere Enseignee
Ecole des Beaux Arts - Tunis 1971 - 1972	Professeur	Psychologie de la perception (cours)
Institut Supérieur de Gestion des entreprises Tunis 1971 - 1972	Animateur de Séminaire	Relation; Humaines - (Séminaires à Tunis et Rabat, Maroc) Publication; "l'Intervention Psycho-Socio-Logique" (Co-Auteur)

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(6)

CURRICULUM VITAE

DOMINIQUE MARIE JACQUELINE RABHI

Etat Civil

Nom	:	RABHI
Nom de Jeune Fille	:	Boyer
Prenoms	:	Dominique Marie Jacqueline
Date de Naissance	:	9 Janvier 1947
Lieu de Naissance	:	Paris 3e
Nationalite	:	Francaise
Situation de Famille	:	Mariee
Adresse	:	11, Rue des Champs Cite Bouchoucha (Le Bardo)

Etudes Secondaires et Universitaires

Etudes Secondaires effectuées au Lycée Claude Monet, Paris 13e, jusqu'en lettres Supérieures

Diplômes obtenus : Ière partie du baccalauréat, série B, Juin 1964

2è partie du baccalauréat, série philosophie, Juin 1965 (Mention A.B.)

Etudes Supérieures effectuées à la Faculté des lettres et Science Humaines de Paris

Diplôme obtenus : Certificat d'Etudes Littéraires Générales Juin 1966

1ère année de Licence de Psychologie Octobre 1967

2ème année de Licence de Psychologie Octobre 1968

Certificat de Maîtrise de Psychologie:
Psychologie génétique - Octobre 1969

Psychologie clinique - Juin 1971

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Curriculum Vitae
Dominique Rabhi

Activites Professionnelles

-Du 1er Janvier 1969 au 1er Mars 1970-

Psychologie dans le cadre d'un jardin d'enfants et de classes spécialisées pour enfants retardés scolaire.
Institut de Recherche et de Formation aux Relations Humaines
122, Av. Du General Leclerc - 95 Pierrelay - France.

-De Mars 1970 à Juin 1970-

Enquêtrice dans un Cabinet de Marketing
Cabinet Jousse
20, Rue de Longchamps - Paris 16e

-De Mars 1970 à Février 1971-

Psychologue vacataire au Centre de Foramtion et de Recherche de l'Education Surveillée
54, Rue de Garches - 92 Vaucresson - France

-De Février 1971 à Juin 1971-

Conseillère d'orientation Scolaire et Professionnelle
Centre d'O.S.P. de Massy (91) France

-De Février 1968 à Juin 1971-

Membre du Comité de Rédaction du Bulletin de Psychologie
17, Rue de la Sorbonne Paris Ve

-De Mars 1972 à Mai 1972-

Psychologue à L'Institut National de Protection de l'Enfance
Le Bardo - Tunisie

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APPENDIX I

August 31, 1972

Yale Tunis Project

Analysis of Social Questionnaire Completed at Birth
(questions addressed to mother in hospital)

James Brown, B.A.(Soc.) and H. Boutourline Young, M.D.

In general the answers showed a close similarity. Some exceptions will be discussed.

Question 1. Occupation Head of Family	Djebel Djelloud	Djebel Lahmar	Melassine	Saida Manoubia	Medina
Unemployed	3%	8%	6%	5%	4%
Daily Labourer	22%	38%	33%	43%	24%
Non-spec. Worker	58%	50%	56%	48%	58%
Total Low Income Lab.	83%	96%	95%	96%	86%
Rel. Skilled Worker	17%	4%	5%	4%	13%
Total	100%	100%	100%	100%	100%

Both Djebel Djelloud and the Medina have a higher proportion of relatively skilled workers. There is little difference between the other three zones.

Question 2. Education Head of Family					
None	60%	65%	66%	70%	64%
Koteb	29%	22%	24%	25%	20%
Primary Not Complete	11%	9%	10%	5%	16%
Primary Complete	0%	4%	0%	0%	0%
Total	100%	100%	100%	100%	100%

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The koteb is a pre-school institution in which the verses of the Koran are learnt and recited by heart. There is no formal educational instruction.

There is much similarity between the areas with Saida Manoubia trailing behind the other four in respect of primary school experience.

Question 3. Mother's Education	Djebel Djelloud	Djebel Lahmar	Melassine	Saida Manoubia	Medina
None	88%	95%	90%	92%	86%
Koteb	3%	2%	3%	3%	1%
Primary Not Complete	8%	2%	7%	5%	13%
Primary Complete	1%	1%	0%	0%	0%
Total	100%	100%	100%	100%	100%

There are some differences in respect of non-completed primary school where the Medina leads Djebel Djelloud and Melassine with the other areas trailing behind. However, John Simmons, Ph.D. has provided evidence that those who do not complete primary school have a tendency to regress to the educational level of those who have not attended primary school. This same comment holds for the educational level of the father.

Question 4.

Family Income					
Tun. Dinars/Month	27	24	22	19	23
Persons/Home	6.9	6.7	6.1	6.5	6.5
Income/Person/Month	3.9	3.6	3.6	2.9	3.4
Rooms (incl. kitchen but excl. bath if any)	1.9	1.6	1.6	1.5	1.8

There is little difference between the areas, although Saida Manoubia lags behind the others in respect of income per head. Above is Question 4. covering total family income, income/month per family member, persons in the family, available rooms. Person/room ratio has not been set down but may be easily calculated. Fortunately Saida Manoubia is a feeding area, well randomized.

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Question 5.	Djebel Djelloud	Djebel Lahmar	Melassine	Saida Manoubia	Medina
Father's Age	35	36	36	38	36

There are no appreciable differences.

Question 6.					
Mother's Age	27	27	27	28	28

Same comment.

Question 7.					
Number of pregnancies	4.6	5.1	4.6	4.8	5.3

Same comment.

Question 8.					
Child Deaths Divided by Pregnancies	.14	.15	.12	.10	.14

Here what has appeared the poorest area (Saida Manoubia) has the most favourable mortality rate. Perhaps this reflects the "flatness" of the state of poverty throughout the areas.

Question 9.					
Abortions Divided by Pregnancies	.08	.07	.07	.07	.07

Differences are minimal between the areas.

Question 10.					
Place of Origin of Father					
Tunis	24%	16%	16%	11%	29%
Other	76%	84%	84%	89%	71%
Years in Tunis	14	18	17	18	15

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Question 10. (continued)	Djebel Djelloud	Djebel Lahmar	Melassine	Saida Manoubia	Medina
Place of Origin					
Tunis	24%	16%	16%	11%	29%
Bizerte	2%	3%	9%	3%	3%
Beja	14%	19%	21%	24%	10%
Jendouba	7%	5%	10%	12%	5%
Kef	21%	29%	23%	22%	10%
Kasserine	6%	5%	6%	8%	3%
Kairouan	3%	2%	2%	6%	0%
Gafsa	1%	0%	0%	0%	6%
Gabes	5%	9%	2%	6%	6%
Medinine	1%	4%	5%	3%	16%
Sfax	6%	2%	2%	3%	1%
Sousse	7%	6%	4%	2%	5%
Nabeul	3%	0%	0%	0%	6%
Exterieur	0%	0%	0%	0%	0%
	100%	100%	100%	100%	100%

Here some differences are apparent. There is an appreciable proportion of people born in Tunis in all zones but the Medina and Djebel Djelloud preponderate and the fewest are found in Saida Manoubia. The Medina also gathers fewer people from Beja and Kef, making up, however, on the proportion from Medinine.

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